Areca Expander Box

ARC-8028 SAS Expander Box

USER'S Manual

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FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

Manufacturer's Declaration for CE Certification

We confirm ARC-8028 has been tested and found compliant with the requirements in the council directive relating to the EMC Directive 2004/108/EC. Regarding to the electromagnetic compatibility, the following standards were applied:

EN 55022: 2006, Class B
EN 61000-3-2: 2006
EN 61000-3-3: 1995+A1: 2001+A2: 2005

EN 55024:1998+A1:2001=A2:2003
IEC61000-4-2: 2001
IEC61000-4-3: 2006
IEC61000-4-4: 2004
IEC61000-4-5: 2005
IEC61000-4-6: 2006
IEC61000-4-8: 2001
IEC61000-4-11: 2004

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1. Introduction

1.1 Overview

The 12Gb/s SAS ARC-8028 expander module is designed with an integrated ARM Cortex-R4 processor for topology management functions such as discovery, enclosure and drive management, and LED management. The ARC-8028 expander module features three or four 12Gb/s SAS SFF-8644 connectors. It is designed to fit into a stand-alone box and can be installed in a 5.25" mounting shell. The ARC-8028 is ideal for enclosure customers that want to support up to 24/32 channels 12Gb/s SAS or 6Gb/s and 3Gb/s SAS/SATA JBOD function units using SFF-8643 SAS cables. The ARC-8028 firmware has been included the failover to utilize the most up-to-date technology available, providing your system with reliable, high-quality performance. User can configure ARC-8028 redundant mode with multiple expander module using either RAID controllers or HBAs to achieve failover protection.

Unparalleled Performance

The ARC-8028 series expanders include 24/32 internal plus 12/16 external 12Gb/s SAS ports connection for host and easy expansion. High performance architecture sets new boundaries of industry performance expectations: 12Gb/s SAS or 6Gb/s and 3Gb/s SAS/SATA. The ARC-8028 incorporates the latest enhancements in SAS along with new LSI DataBolt bandwidth optimizer technology. This is designed to help facilitate the industry transition to 12Gb/s SAS-enabled systems by allowing users to take advantage of 12Gb/s speeds while utilizing existing 6Gb/s drives and backplanes. Using DataBolt, the ARC-8028 buffers 6Gb/s data and then transfers it out to the host at 12Gb/s speeds in order to match the bandwidth between faster hosts and slower SAS or SATA devices.

Maximum Interoperability

Areca presents its ultra-high performance and high reliability 12Gb/s SAS expander module for a cost-effective and enterprise-class JBOD storage enclosure. A 12Gb/s SAS expander module literally expands the number of end devices that you can connect

together. Expander devices, typically embedded into an expander module to connect system backplane, support large configurations of SAS end devices, including SAS host/RAID adapters and SAS and SATA disk drives. The SAS protocol defines a mechanism that has been implemented in the SAS expanders to guarantee fair access between drives in a domain. With ARC-8028 SAS expander, you can build large and complex storage topologies.

Easy Management

The expander box contains an embedded expander manager that can access via in-band SES-2 over SMP protocol and out-of band RS-232 port. An out-of-band serial port is available for managing the configuration and monitoring the expander. The preferred I/O connection for server and JBOD backplanes is the internal Mini SAS HD SFF-8643 connector. This connector has eight signal pins to support four SAS/SATA drives and six pins for the SFF-8485 compliant SGPIO side-band signals. The Areca expander firmware and EPLD has implemented the SES-2 protocol and disk activity map to SGPIO based indicator LEDs. For backplane without SGPIO supporting, the expander box also provides two kinds of alternative LED cable header to support the individual fault/activity status indicator for those backplanes. In addition to meet different enclosure, ARC-8028 expander box has implemented autonomous chassis management of two power supplies status connectors, four fan monitor/speed control connectors through the SES-2 protocol. Firmware and configuration data including vendor identification strings can be customized or tuned for each customer.

1.2 Technical Specifications

Enclosure Expander Modules

- Expander Board: 1 x modules
- Sensors: 1 x sensor per expander board

Controller External Connectors

SAS Connectors - 3/4 x Min SAS HD SFF-8644 connectors

- 1 x SAS "IN" connector for connection to the host (default)
- 2/3 x SAS "OUT" connector for expansion to next JBOD enclosure (default)

Drives

SAS Hot-Plug Hard Drives
- Up to 24/32 12Gb/s, 6Gb/s or 3Gb/s SAS HDD/SSD

SATA Hot-Plug Hard Drives
- Up to 24/32 6Gb/s or 3Gb/s SATA HDD/SSD

Internal Connectors
- 6/8 Mini SAS HD SFF-8643 connectors
- 1 x 6-pin PCI-E power connector
- 4 x 3-pin fan connector
- 2 x 2-pin power status connector
- 1 x 6-pin LCD connector
- 1 x 7-pin dual expander heartbeat connector

Serial Connector (per Expander Board)
- 1 x 6-pin UART RJ-11 connector (for expander box manager only)
- 1 x RJ45 LAN connector (for manufacture manager only)

LED Indicators

Internal fault/activity header
- 6 x 8-pin 2.54mm for 24/32 activity and fault header

External SAS Port LED Indicators
- Two one-color LED status indicators for each SAS port, one for SAS port link and one for the activity status

Monitors/Indicators
- LCD Control Panel for setup, alarm mute and configuration
- System status indication through LCD, LED (link status and activity) and alarm buzzer
- Enclosure management (protocols SES-2 over SAS ports) ready

Management
- In-band SAS port
- Out-of-band RS232 serial port
- CLI through RS232 serial port

Physical
- 41(H) x 145(W) x 200(D) mm

Environmental

Temperature

- Operating 10° to 40°C
- Storage –40° to 70°C

Relative Humidity

- Operating 10% to 80% (non-condensing)
- Storage 5% to 95% (non-condensing)

Model Name	Interface	External SAS Ports	External SAS Connector	Internal SAS Ports	Internal SAS Connector
ARC-8028-24	12 Gb/s SAS	12	SFF-8644	24	SFF-8643
ARC-8028-32	12 Gb/s SAS	16	SFF-8644	32	SFF-8643

2. Hardware Installation

This section describes the procedures for installing the cable solution external ARC-8028 expander box.

2.1 Before Your Begin Installation

Thanks for purchasing the cable solution external ARC-8028 SAS expander as your data storage subsystem. This user manual gives simple step-by-step instructions for installing and configuring the SAS expander box. To ensure personal safety and to protect your equipment and data, reading the following information package list carefully before you begin installing.

Package Contents

Open the package carefully, and make sure that none of the items listed below are missing. The ARC-8028 expander box kit may have included the following items in the shipping package:

- ARC-8028 expander box with LCD module
- 1 x RJ11 to RS-232 DB9 cable
- 1 x User manual
- 8 x drive mounting screws (4 screws for each side)
- Adapter convert two 4 pin peripheral power cables into a PCI-E power cable

If any item is missing or damaged, please contact your local resellers for service.

2.2 Board Layout & Outline

The ARC-8028 expander box can support a family included 6/8 internal SFF-8643 connectors with additional 3/4 external Mini SAS HD SFF-8644 connectors. This section provides the board layout and connector/jumper for the SAS expander box.

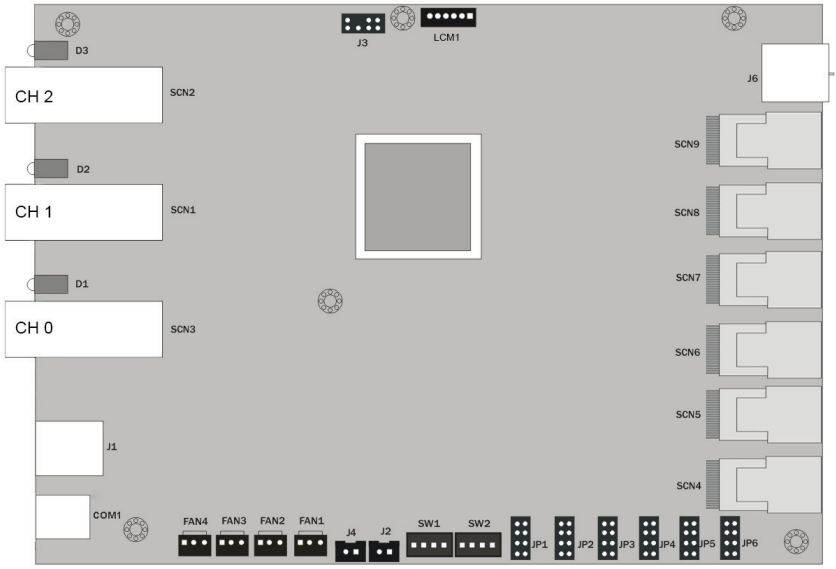


Figure 2-1, ARC-8028-24 Expander Board

Connector	Description	Type
1. (SCN3)	12Gb/s SAS Expander Out (Default, CH0)	SFF-8644
2. (SCN2)	12Gb/s SAS Expander Out (Deafult, CH2)	SFF-8644
3. (SCN1)	12Gb/s SAS Expander In (Default, CH1)	SFF-8644
4. (D3)	LED for SCN2 Port Link and Access	Bi-color DIP
5. (D2)	LED for SCN1 Port Link and Access	Bi-color DIP
6. (D1)	LED for SCN3 Port Link and Access	Bi-color DIP
7. (SCN4)	12Gb/s SAS 21-24 Ports (Internal)	SFF-8643
8. (SCN5)	12Gb/s SAS 17-20 Ports (Internal)	SFF-8643
9. (SCN6)	12Gb/s SAS 13-16 Ports (Internal)	SFF-8643
10. (SCN7)	12Gb/s SAS 9-12 Ports (Internal)	SFF-8643
11. (SCN8)	12Gb/s SAS 5-8 Ports (Internal)	SFF-8643
12. (SCN9)	12Gb/s SAS 1-4 Ports (Internal)	SFF-8643

Table 2-1, ARC-8028-24 Connectors and Status

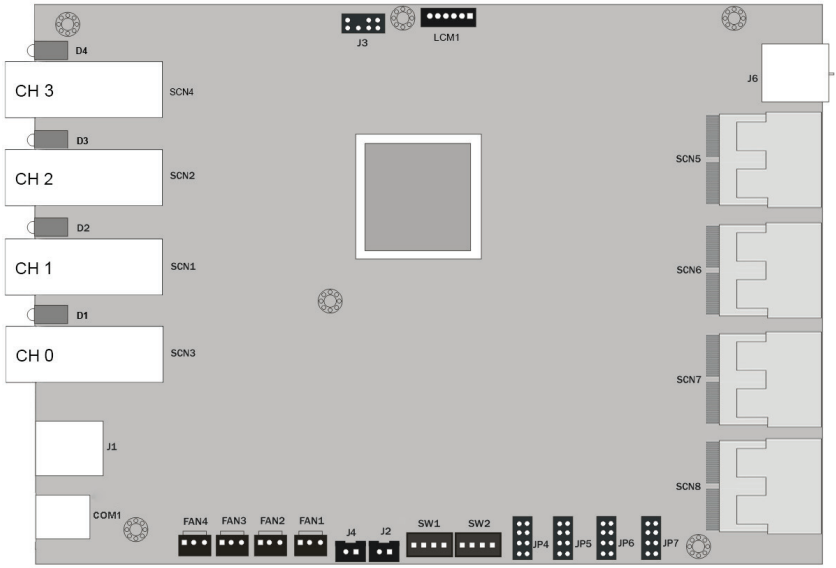


Figure 2-2, ARC-8028-32 Expander Board

Connector	Description	Type
1. (SCN3)	12Gb/s SAS Expander Out (Default, CH0)	SFF-8644
2. (SCN1)	12Gb/s SAS Expander In (Default, CH1)	SFF-8644
3. (SCN2)	12Gb/s SAS Expander Out (Default, CH2)	SFF-8644
4. (SCN4)	12Gb/s SAS Expander Out (Default, CH3)	SFF-8644
5. (D1)	LED for SCN3 Port Link and Access	Bi-color DIP
6. (D2)	LED for SCN1 Port Link and Access	Bi-color DIP
7. (D3)	LED for SCN2 Port Link and Access	Bi-color DIP
8. (D4)	LED for SCN4 Port Link and Access	Bi-color DIP
9. (SCN5)	12Gb/s SAS 1-8 Ports (Internal)	Dual 4-Lane SFF-8643
10. (SCN6)	12Gb/s SAS 9-16 Ports (Internal)	SFF-8643
11. (SCN7)	12Gb/s SAS 17-24 Ports (Internal)	SFF-8643
12. (SCN8)	12Gb/s SAS 25-32 Ports (Internal)	SFF-8643

Table 2-2, ARC-8028-32 Connectors and Status

<table>
<tr><th>Connector</th><th>Description</th><th>Type</th></tr>
<tr><td>1. (COM1)</td><td>RS232 for Expander Configuration</td><td>RJ11 Connector</td></tr>
<tr><td>2. (J1)</td><td>Reserved for Future Function Upgrade</td><td>RJ45 Connector</td></tr>
<tr><td>3. (J3)</td><td>Dual Expander Heartbeat Channel</td><td>7-Pin Header</td></tr>
<tr><td>4. (LCM1)</td><td>LCD Connector</td><td>6-Pin Box Header</td></tr>
<tr><td>5. (FAN1)</td><td>Fan1 with RPM Sense</td><td>3-Pin Connector</td></tr>
<tr><td>6. (FAN2)</td><td>Fan2 with RPM Sense</td><td>3-Pin Connector</td></tr>
<tr><td>7. (FAN3)</td><td>Fan3 with RPM Sense</td><td>3-Pin Connector</td></tr>
<tr><td>8. (FAN4)</td><td>Fan4 with RPM Sense</td><td>3-Pin Connector</td></tr>
<tr><td>9. (J2)</td><td>Power 1 Status Input</td><td>2-Pin Header</td></tr>
<tr><td>10. (J4)</td><td>Power 2 Status Input</td><td>2-Pin Header</td></tr>
<tr><td>11. (JP1)</td><td>Individual Activity LED for 12Gb/s SAS 1-8 Ports (for ARC-8028-24 only)</td><td>8-Pin Header</td></tr>
<tr><td>12. (JP2)</td><td>Individual Activity LED for 12Gb/s SAS 9-16 Ports (for ARC-8028-24 only)</td><td>8-Pin Header</td></tr>
<tr><td>13. (JP3)</td><td>Individual Activity LED for 12Gb/s SAS 17-24 Ports (for ARC-8028-24 only)</td><td>8-Pin Header</td></tr>
<tr><td>14. (JP4)</td><td>Individual Fault LED for 12Gb/s SAS 1-8 Ports</td><td>8-Pin Header</td></tr>
<tr><td>15. (JP5)</td><td>Individual Fault LED for 12Gb/s SAS 9-16 Ports</td><td>8-Pin Header</td></tr>
<tr><td>16. (JP6)</td><td>Individual Fault LED for 12Gb/s SAS 17-24 Ports</td><td>8-Pin Header</td></tr>
<tr><td>17. (JP7)</td><td>Individual Fault LED for 12Gb/s SAS 25-32 Ports (for ARC-8028-32 only)</td><td>8-Pin Header</td></tr>
<tr><td>18. (J6)</td><td>PCI-E Power Connector</td><td>6-Pin Connector</td></tr>
<tr><td>19. (SW1)</td><td>Fan1-Fan4 Input Definition
<table>
<tr><td>SW1 (1-3)</td><td>FAN_NO.</td></tr>
<tr><td>ON OFF OFF</td><td>1 (FAN1)</td></tr>
<tr><td>OFF ON OFF</td><td>2 (FAN1~FAN2)</td></tr>
<tr><td>ON ON OFF</td><td>3 (FAN1~FAN3)</td></tr>
<tr><td>OFF OFF ON</td><td>4 (FAN1~FAN4)</td></tr>
</table>
Expander Module Definition
<table>
<tr><td>SW1 (4)</td><td>Expander_Select</td></tr>
<tr><td>ON</td><td>Dual Expander</td></tr>
<tr><td>OFF</td><td>Single Expander</td></tr>
</table></td><td>Micro DIP-Switch</td></tr>
</table>

<table>
<tr>
<td>20. (SW2)</td>
<td>
Expander Module Mode Control Function
<table>
<tr><td>SW2 (1)</td><td>Expander_Mode_Select</td></tr>
<tr><td>ON</td><td>SLAVE</td></tr>
<tr><td>OFF</td><td>MASTER</td></tr>
</table>
Fan/Power Detective Control Function
<table>
<tr><td>SW2 (2)</td><td>PW_FLT1 STATUS</td></tr>
<tr><td>ON</td><td>ENABLE</td></tr>
<tr><td>OFF</td><td>DISABLE</td></tr>
</table>
<table>
<tr><td>SW2 (3)</td><td>PW_FLT2 STATUS</td></tr>
<tr><td>ON</td><td>ENABLE</td></tr>
<tr><td>OFF</td><td>DISABLE</td></tr>
</table>
<table>
<tr><td>SW2 (4)</td><td>FAN CONTROL</td></tr>
<tr><td>ON</td><td>ENABLE</td></tr>
<tr><td>OFF</td><td>DISABLE</td></tr>
</table>
</td>
<td>Micro DIP-Switch

ENABLE: Monitor function enable.
DISABLE: Monitor function disable.

SLAVE: Dual expander slave mode
MASTER: Dual expander master mode</td>
</tr>
</table>

Table 2-3, ARC-8028-24/32 Jumpers and Switches

Note:

- Fan Headers (FAN1~FAN4)
  The box has four 3-pin fan headers, pin (1, 2, 3)=(GND, Power Input, Signal Input), which can control and detect the fan speed. Each header can only connect to one fan. You can directly connect the enclosure cooling fan to those 3-pin header. Controller hardware monitor can check the RPM status of the cooling fans and show those fan status on the controller's hardware information based on the SW1 micro switch definition (Fan1-Fan4). SW2 (4) micro dip-switch is used to control the fan monitor function. Current limitation of total fan headers are 6A.

- Power Status Input Headers (J2 and J4)
  Power status 2-pin input headers monitors enclosure two power supply status output pin based on the SW2 (2 and 3) micro dip-switch.
  Pin definition for J2 and J4.
  Pin 1: GND
  Pin 2: Signal input; Low: power ok, High: power fail

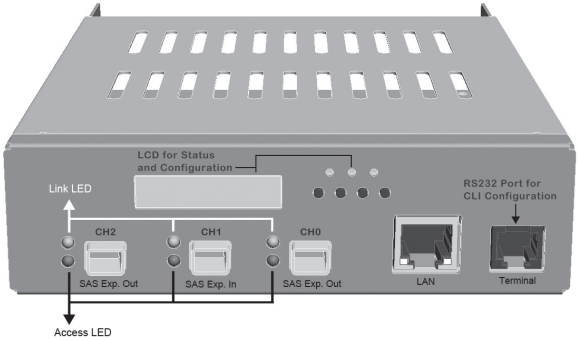


Figure 2-3, Front View of ARC-8028-24

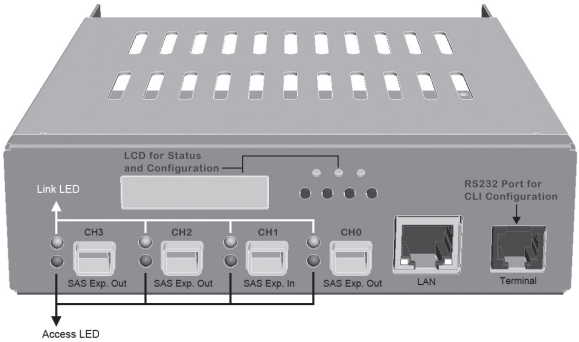


Figure 2-4, Front View of ARC-8028-32

The following describes the ARC-8028-24/32 expander box link/access LED.

Expander Port LED	Status
Link LED (Green light)	1. When host port link LED is lit for 1 second and turns off for 3 seconds that indicates the one link has connected. 2. When host port Link LED is lit for 2 seconds and turns off for 2 seconds that indicates the two links have connected. 3. When host port Link LED is lit for 4 seconds that indicates the four links have connected.
Access LED (Blue light)	When access LED is lit that indicates the SAS host accesses to the ARC-8028 expander box.

2.3 Installation

The ARC-8028 expander box housed in a 5¼-inch half-height canister with a removable LCD module, a host channel, two expander and a RS-232 CLI port controller. The expander controller is provided for customers who want to use the exiting SAS/SATA enclosure. It is designed to fit into one 5¼-inch half-height drive bays located in a server chassis or storage case. Standard mounting holes are located on both sides of the controller canister. These mounting holes accept commonly available No. 6-32 coarse-thread screws. Use the following instructions below to install the ARC-8028 expander box.

Step 1. Power the Enclosure Off

Turn off the enclosure and remove the AC power cord. Remove the enclosure's cover. For the instructions, please see the enclosure documentation.

Step 2. Unpack ARC-8028 Expander Box

Unpack and remove the ARC-8028 expander box from the package. Inspect it carefully, if anything is missing or damaged, contact your local dealer.

Step 3. Mounting ARC-8028 Expander Box into the Enclosure

Remove the enclosure cover and find a 5.25 inch CD-ROM wide place to fasten the ARC-8028 expander box in the external enclosure. The expander box requires one 5.25” half-height drive bay.

Step 4. Connecting Expander Controller Power

The ARC-8028 series expander box supports 6 pin PCI-E power connector. If your power supply doesn’t have a 6 pin PCI-E power cable then you can use the adapter to convert two 4 pin peripheral power cables into a PCI-E power cable. If you use an adapter then be sure to plug the 4 pin peripheral power connectors into separate power cables coming from the power supply.

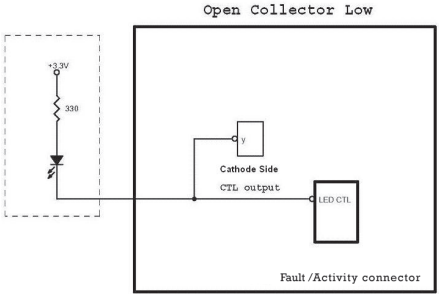
Step 5. Install the LED Cable (Optional)

Please check the method which controls fault LED on the backplane. If the backplane supports SGPIO feature, ignore the individual fault LED cable connection. The preferred I/O connector for server backplanes is the Min SAS HD SFF-8643 internal connector. This connector has eight signal pins to support four SAS/SATA drives and six pins for the SGPIO (Serial General Purpose Input/ Output) side-band signals. The SGPIO bus is used for efficient fault/activity LED management and sensing drive locate status. See SFF 8485 for the specification of the SGPIO bus. For backplane without enclosure SGPIO support, please refer to section step 5-1. LED cables for fault/activity LED cable installation.

Step 5-1. Install and Re-check Fault LED Cable Connections (Optional)

Make sure that the proper failed drive channel information is displayed by the fault LEDs. An improper fault LED cable connection will tell the user to ''Hot Swap'' the wrong drive. This can result in removing the wrong disk (one that is functioning properly) from the controller. This can result in failure and loss of system data.

The following electronics schematic is the SAS expander logical of fault/activity header. The signal for each pin is cathode (-) side.

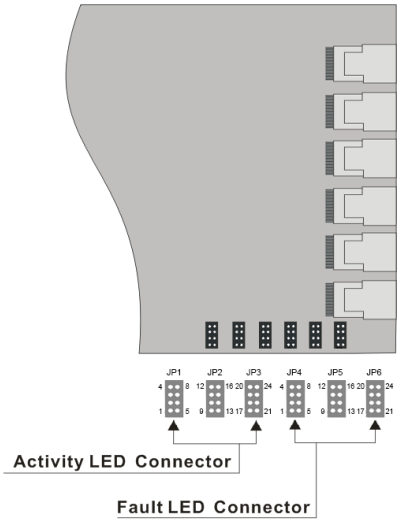


Note:

Cables for the individual drive LEDs may come with a drive cage, or you may need to purchase them.

The following diagram shows all LEDs, connectors and pin locations.

Figure 2-5, ARC-8028-24
Activity/Fault LED Connector



Connect the cables for the drive activity LEDs and fault LEDs between the backplane of the cage and the respective connector on the ARC-8028 expander box header. The following table describes the activity/fault LED behavior.

LED	Normal Status	Problem Indication
Activity LED	1. When the activity LED is lit, there is I/O activity on that disk drive. 2. When the LED is dark, there is no activity on that disk drive.	N/A
Fault LED	1. When the fault LED is lit, there is no disk present. 2. When the fault LED is off, that disk is present and status is normal. Some controllers support the "Identify Drive" function.When the "Identify Drive" is selected, the selected drive fault LED will blank.	1. When the fault LED is blinking (2 times/sec), that indicate disk drive has failed and should be hot-swapped immediately. 2. When the activity LED is lit and fault LED is blinking (10 times/sec) that indicates there is rebuilding activity on the disk drive.

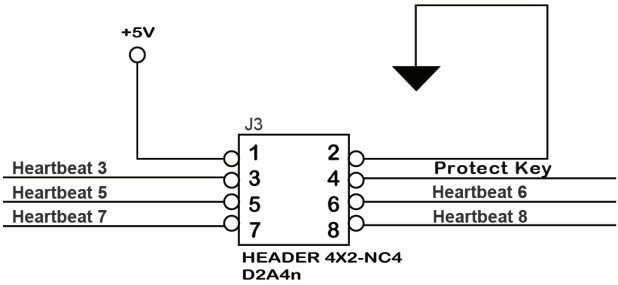
Step 6. Connecting SFF-8643 Cable to Backplane

The ARC-8028 expander box supports 6/8 Mini SAS HD SFF-8643 connectors on the back side. User uses suitable cable (depends on the backplane) to connect the expander box connector to the enclosure backplane.

Step 7. Setting Up the Dual Expander Mode (Optional)

If you don't want to support dual expander mode, you can skip this step to step 8. To set up the dual function of the expanders, you must perform the following hardware step:

- Connecting the Heartbeat Bus
  Connect the 7-pin cable to the dual expander J3 header (2 x 4 2.54mm) of the primary and secondary expanders. The following picture is the signal name for heartbeat J3 header.



- Adjust the Micro Dip-switch
  SW1(4) & SW2(1)micro dip-switch are used to enable or disable the dual expander relative function.

SW1 (4)	DUAL CONTROL
ON	ENABLE
OFF	DISABLE

SW2 (1)	MASTER/SLAVE
ON	SLAVE
OFF	MASTER

Step 8. Install the Enclosure Top Cover

Check the installation thoroughly, reinstall the enclosure cover, and reconnect the power cord cables.

Step 9. Loading Drive to the Drive Tray

You can connect the SAS/SATA drives to the controller through direct cable and backplane solutions. In the direct connection, SAS/SATA drives are directly connected to SAS PHY port with SAS/SATA cables. The SAS expander module can support up to 12/16/24/32 PHY internal ports and 12/16 PHY external ports. Remove the front

bezel from the computer chassis and install the cages or SAS/SATA drives in the computer chassis. Loading drives to the drive tray if cages are installed. Be sure that the power is connected to the individual drives or cage.

In the backplane solution, SAS/SATA drives are directly connected to SAS system backplane. The number of SAS/SATA drives is limited to the number of slots available on the backplane. Your ARC-8028 expander box supports up to 12/16/24/32 12Gb/s SAS or SATA 6Gb/s drives, each one contained in its individual drive carrier. Each drive is hot-pluggable, allowing you to remove and insert drives without shutting down your ARC-8028 expander enclosure. Install the drives to 12-bays ARC-8028 expander enclosure as shown in figure 2-6.

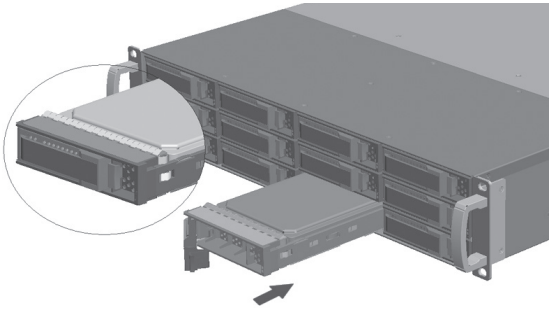


Figure 2-6, Install Drive into Enclosure

Step 10. Connect to Host Interface

Once the ARC-8028 expander box has finished the configuration (optional), then you can connect it to a host interface. The enclosure can be connected to a host interface which may a host adapter or RAID controller through the Min SAS HD SFF-8644 SAS cable. By installing host adapter port and ARC-8028 expander box using the correct external cables which may be included in your enclosure kits.

Step 11. Connecting Expander Box's RS-232 Port (Optional)

The ARC-8028 expander box's system functions can be managed via a PC running a VT-100 terminal emulation program, or a VT-

100 compatible terminal. The provided internal cable converts the RS-232C signals from the RJ11 into the one 9-pin D-Sub male connector.

Step 12. Add More Expander Boxes (Optional)

ARC-8028 expander box can run in one of two modes:

1. Normal Mode
2. Zone Mode

You must select either mode using the CLI utility and restart the ARC-8028 expander enclosure again. The manufacture is default on the Normal Mode. Changing the mode while the ARC-8028 expander box is on. This will not affect expander operation until the ARC-8028 expander enclosure is rebooted.

1. In normal mode

   A SAS host can communicate with up to 24/32 drives in the 24/32 bay enclosure via a single ARC-8028 expander box. ARC-8028 SAS expander box is a device that contain expander ports. Expander ports may support being attached to SAS initiator ports, SAS and/or SATA target ports, and to other expander ports. The SAS RAID controller or host adapter can support daisy-chain how many enclosures which depend on the RAID controller or the host adapter firmware. The following figure shows how to connect the external Min SAS HD cable from the SAS RAID controller that has external ports to the ARC-8028 expander box enclosures.

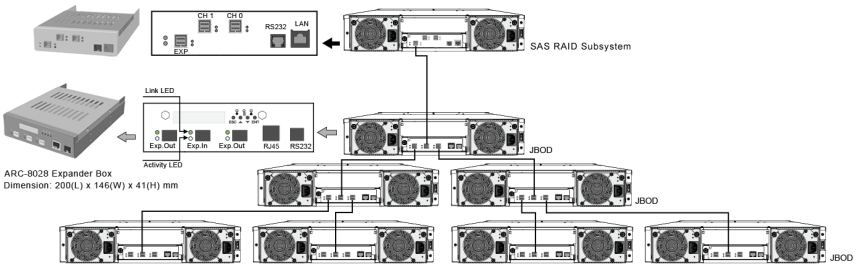
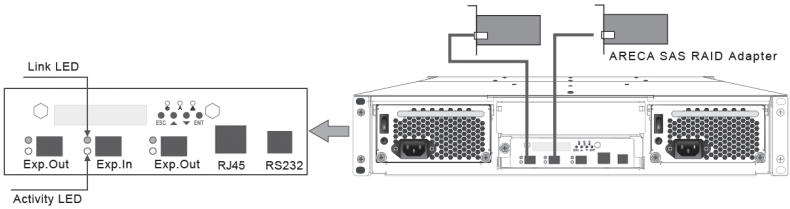


Figure 2-7, Daisy-chain SAS Expander

2. In zone mode

The SAS expander box can be split into up to 8 virtual groups. Each group drive channels and external cable connectors are assigned by CLI GROUP command. The following figure is shown the SAS expander box which has split into 2 virtual groups. Each group drive channels are controlled by individual host adapter using SAS CH1 and SAS CH2.



Note:

1. Please refer to chapter 4.3 CLI features of GROUP command which is used to associate the external port and the devices/phys slot.
2. Turn on the expander enclosure first to make sure the SAS RAID controller or SAS host adapter recognizes the drives in the enclosure.

Step 13. Connect the Enclosure Power

Connect the power cord to a grounded electronical outlet and to the expander enclosure power. Turn on the power switch at the rear of the enclosure.

Step 14. Configure ARC-8028 Expander Box

The ARC-8028 expander box is normally delivered with LCD pre-installed. Your ARC-8028 expander box can be managed by using the LCD with keypad or a serial device (terminal emulation).

- Method 1: LCD Panel with Keypad
  You can use LCD front panel and keypad function to simply manage the ARC-8028 expander box. The LCD status panel also informs you of the expander's current system functions at a glance. The LCD provides a system of screens with areas for information, status indication, or menus. The LCD screen displays up to two lines at a time of menu items or other information. Please refer to Chapter 3 LCD Configuration Manager.

- Method 2: RS-232 Port
  The ARC-8028 expander box's system functions can also be managed via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the ARC-8028 expander box for accessing the text-based setup menu. Please refer to Chapter 4 CLI Manager.

3. LCD Configuration Manager

The SAS expander box LCD configuration utility is a character-based utility that you can run after powering the unit. Use LCD configuration utility to see and configure:

- Alerts Menu,
- Voltage,
- Set Link,
- Set Alarm,
- Set Password,
- Save Config, and
- System Reset

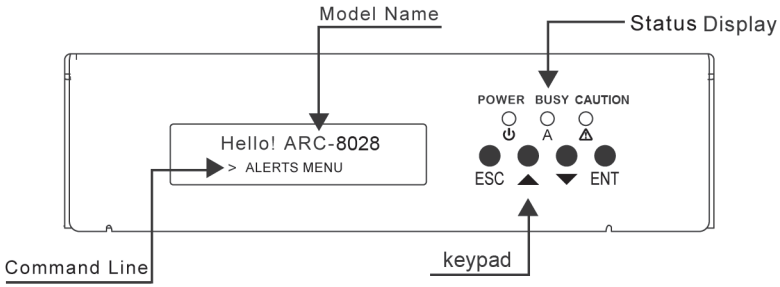
The LCD display front panel function keys are the primary user interface for the SAS expander box. Except for the "Firmware update", all configurations can also be performed through this interface.

3.1 Using Local Front Panel Touch-Control Keypad

The front panel keypad and liquid crystal display (LCD) is the primary user interface for the SAS expander box. All configuration and management of the expander controller and its properly connected disk arrays can be performed from this interface. The front panel keypad and LCD is connected to the ARC-8028 SAS expander box to access the built-in configuration that resides in the SAS expander box's firmware.

The LCD provides a system of screens with areas for information, status indication, or menus. The LCD screen displays up to two lines at a time of menu items or other information.

The initial screen is shown as following:



Function Key Definitions:

The four function keys at the right of the front panel perform the following functions:

Key	Function
Up Arrow	Use to scroll the cursor Upward / Rightward
Down Arrow	Use to scroll the cursor Downward / Leftward
ENT Key	Submit selected icon function (Confirm a selected item)
ESC Key	Return to previous screen (Exit a selection configuration)

There are a variety of failure conditions that cause the ARC-8028 expander box monitoring LED to light. Below table provides a summary of the front panel LED.

Panel LED	Normal Status	Problem Indication
Power LED	Bright green	This LED does not light up after power switched on
Busy LED (Host Access)	Blink green during host computer accessing the expander box	LED never flickers
Caution LED	Unlit	Solid red

3.2 Navigation Map of the LCD

The password option allows user to set or clear the SAS expander box's password protection feature. Once the password has been set, the user can only monitor and configure the SAS expander box by providing the correct password. The password is used to protect the SAS expander box from unauthorized entry. The SAS expander box will check the password only when entering the main menu from the initial screen. The SAS expander box will automatically go back to the initial screen when it does not receive any command in 5 minutes. The SAS expander box's password is default setting at 0000 by the manufacture.

The following flow is an expansion of LCM setup option items hierarchical menu.

LCM setup option items hierarchical menu:

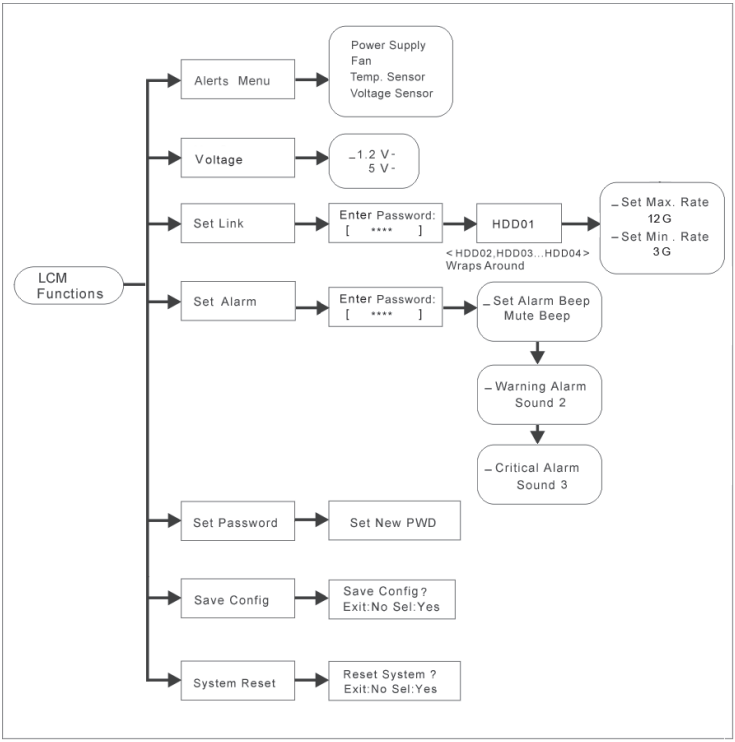


Figure 3.2-1

- **Alerts Menu**
  Show which device that fail to work, its sub-items could be "Power Supply", "Fan", "Temp. Sensor" and "Voltage Sensor".

- **Voltage**
  Show enclosure chip voltage in status data, represent in V.
  The sub-items are shown as below:
  1.2V- , the expander box voltage is 1.2V
  5V- , the expander box voltage is 5V

  For the setup item, the LCM key represent:
  Up key to enter the 0 - 9 data.
  Down key to enter "a" - "z" and "A" - "Z" data.
  Enter key to confirm the input or ready to update a sub-item data.
  Esc/Exit key to go back to the main selection.

- **Set Link**
  Set HDD devices maximun/minimun link speed rate. The value could be 12G, 6G or 3G each of HDD devices link speed will have the sub-items are shown as below:

  _Set Max. Rate
  12G
  _Set Min. Rate
  3G

- **Set Alarm**
  Set enclosure buzzer warning/critical error beep style or mute the current beep. The value could be "Sound 1", "Sound 2", "Sound 3", "Sound 4" and "Sound Disabled". Sound 1 to 4 means different frequency sound. Sound disabled means disable the sound beep. The sub-items are shown below:

  _Set Alarm Beep
  Mute beep

  _Warning Alarm
  Sound 2

  _Critical Alarm
  Sound 3

- **Set Password**
  Change the enclosure LCM/UART CLI password. The sub-item is "Set New PWD".

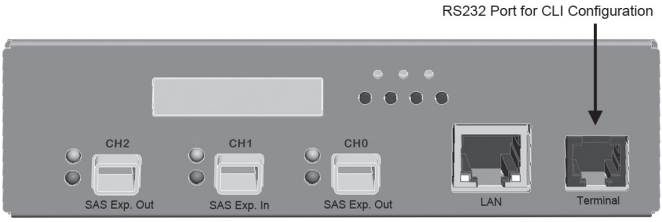
- **Save Config**
  Save all the updated option value into non-volatile memory area.

- **System Reset**
  Reboot the system.

4. CLI Manager

This Command Line Interface (CLI) is provided for you to manage the ARC-8028 series 12/16/24/32 SAS expander system functions. The CLI is useful in environments where a graphical user interface (GUI) is not available.

- **Locations of RS-232C Port**
  The ARC-8028 expander box uses the RJ11 port as the serial port interface. Please use the cable included in the shipping box to configure the expander controller.



- **Establishing the Connection for the RS-232 Port**
  The CLI function can be done by using an ANSI/VT-100 compatible terminal emulation program. You must complete the appropriate installation procedure before proceeding with the CLI function. Whichever terminal emulation program is used must support the 1K XMODEM file transfer protocol.

  The serial port on the ARC-8028 box's I/O shield can be used in VT100 mode. The provided interface cable converts the RS232 signal of the RJ11 connector on the SAS expander controller into a 9-pin D-Sub male connector. The firmware-based terminal SAS expander management interface can access the expander through this RS-232 port. You can attach a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program to the serial port for accessing the text-based setup menu.

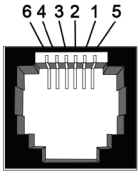
4.1 RS-232C Port Pin Assignment

To ensure proper communications between the SAS expander box and the VT-100 Terminal Emulation, Please configure the VT100 Terminal Emulation settings to the values shown below:

Terminal requirement	
Connection	Null-modem cable
Baud Rate	115,200
Data bits	8
Stop	1
Flow Control	None

The controller RJ11 connector pin assignments are defined as below.

Pin Assignment			
Pin	Definition	Pin	Definition
1	RTS (RS232)	4	GND
2	RXD (RS232)	5	GND
3	TXD (RS232)	6	GND

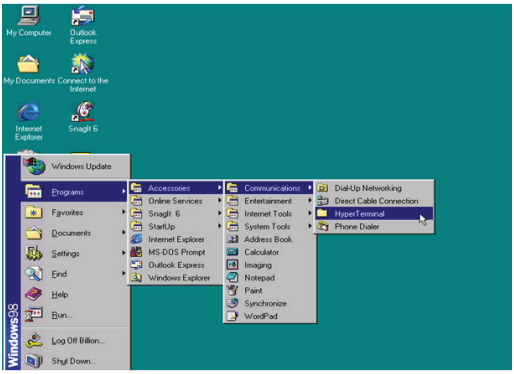


4.2 Start-up VT100 Screen

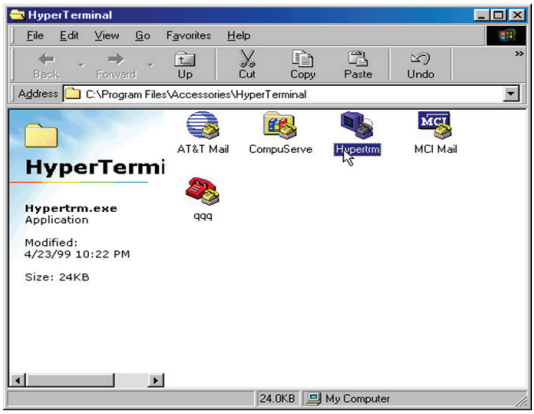
By connecting a VT100 compatible terminal, or a PC operating in an equivalent terminal emulation mode, all CLI administration functions can be exercised from the VT100 terminal.

There are a wide variety of Terminal Emulation packages, but for the most part they should be very similar. The following setup procedure is an example Setup VT100 Terminal in Windows XP system using Hyper Terminal use Version 3.0 or higher.

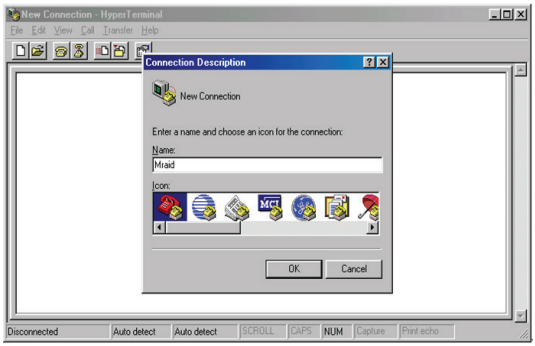
Step 1. Open the "Taskbar Start"/"Programs"/"Accessories"/"Com mmunications"/"Heyper Terminal". (Heyper Terminal requires version 3.0 or higher).



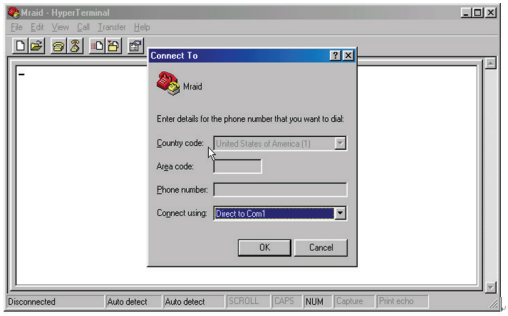
Step 2. Open "HYPERTRM.EXE".



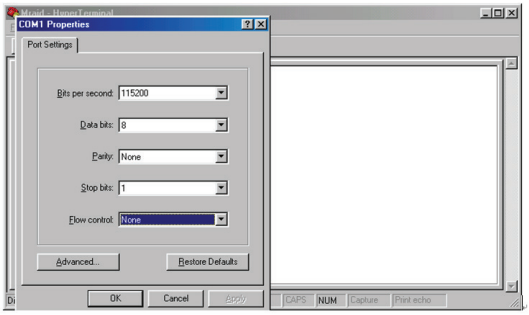
Step 3. Enter a name you prefer and then click "OK".



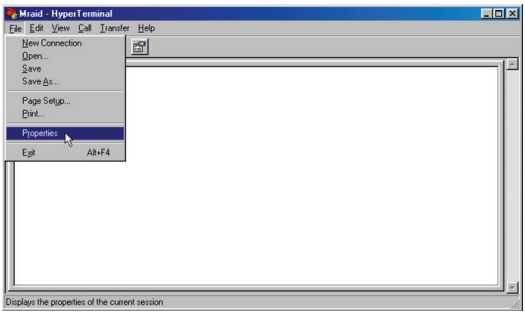
Step 4. Select an appropriate connecting port and then click "OK".



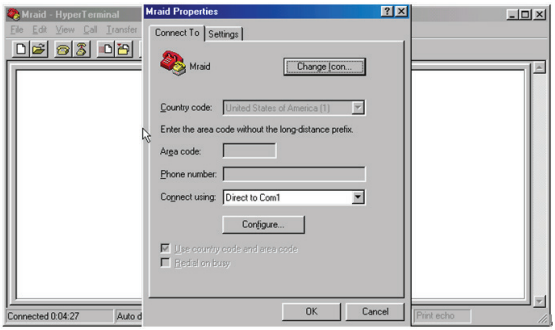
Step 5. Configure the port parameter settings and then click "OK".
Bits per second: 115200
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None



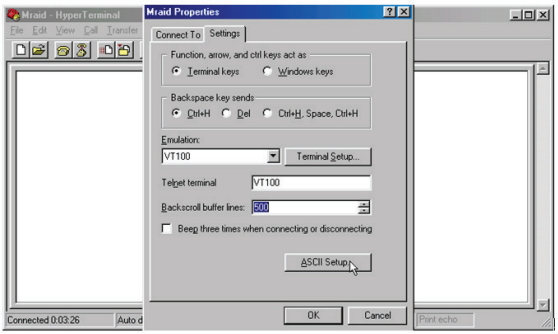
Step 6. Open the file menu and select "Properties".



Step 7. Configure the "Connect To" setting.



Step 8. Configure the "Settings" items and then click "OK".
Function, arrow and ctrl keys act as: Terminal Keys
Backspace key sends: Crtl+H
Emulation: VT100
Telnet terminal: VT100
Back scroll buffer lines: 500



4.3 CLI Command

This section provides detail information about the SAS expander-box's CLI function. All the commands please type in lower case.

• HELP Command

This command provides an on-line table of contents, providing brief descriptions of the help sub-commands. You can use the <CLI> help to get detail information about the CLI commands summary.

Syntax
CLI>help[Enter]

Example:
CLI>help

pass	- Set Password
lo	- Logout CLI Shell
link	- Link Rate Control
edfb	- Bandwidth Optimizer
th	- Temperature Control
group	- Set the PHY Group
sys	- System Information
bu	- Alarm Control
fan	- Fan Speed Control
spin	- Drive SpinUp Control
st	- Store System Setting
lsd	- List Devices Status
showlogs	- Show the Current Logs
fld	- File Download
counters reset (optional)	- Display/Reset all phy counters
sasaddr	- Display expander SAS address

• PASS Command

The pass command allows user to set or clear the expander box password protection feature. Once the password has been set, the user can only monitor and access the expander box setting by providing the correct password. The password can accept max.

8 chars and min. 4 chars. The manufacture default password is **"0000"**.

Syntax
CLI>pass

Example:
CLI>pass
Old Password:****
New Password:****
Verify New Password:****
Password Changed But Not Save Permanently!
Note, use CLI command "st" to keep permanently.

• LO Command

To exit the selected expander box CLI shell, use the lo command.

Syntax
CLI>lo

Example:
CLI>lo
Password:

• LINK Command

The link command allows you to set the operate device link rate that has been connected on expander. Typical parameters include: Max and Min disk speed connected the SAS expander box and High and Low external cable link speed connected the SAS expander box.

1. Set external cable link speed rate

   Syntax
   CLI>link c[0|1|2|3] High Low]
   Index: c[0|1|2|3] External Cable Index
   The cable c0, c1, or c2 is view from right to left or start from top to bottom.
   High-Rate, Low-Rate: [11|10|9] or [12g|6g|3g]

PS. Pls. Save Config. & Reboot To Take Effect
CLI>st

Example:
CLI>link c0,c1 6g 3g ;;;;; set cable0 and cable1 link speed range [6G(10), 3G(9)]
CLI>st
CLI>
Reboot to take effect.

2. Set all slots with same link speed rate

Syntax
CLI>link [Index(D)| 255] High-Rate(D) Low-Rate(D)
Index: Slot Index
High-Rate(D), Low-Rate(D): [11|10|9] or [12g|6g|3g]
PS. Pls. Save Config. & Reboot To Take Effect
CLI>st

Example:
CLI>link 255 12g 3g ;;;;; set all slots with same link speed rate, max=11(12G), min=9(3G)
CLI>st
CLI>
Reboot to take effect.

3. Set internal slot link speed rate

Syntax
CLI>link [Index Max Min]
Index: Slot Index
High-Rate, Low-Rate: [11|10|9] or [12g|6g|3g]
PS. Pls. Save Config. & Reboot To Take Effect
CLI>st

Example:
CLI>link
ArrayDevice Element (0x17):
==========

NAME	PHY	ORG	NLR	MAX	MIN	TYPE	ADDRESS
SLOT 01	13	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	12	6G	6G	12G	3G	SAS	5011B469-189AE00C
SLOT 03	14	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	15	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	9	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	8	6G	**6G**	**12G**	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B
SLOT 09	5	6G	6G	12G	3G	SATA	5011B469-189AE005
SLOT 10	4	6G	6G	12G	3G	SATA	5011B469-189AE004
SLOT 11	6	3G	3G	12G	3G	SAS	500000E0-168F8E92
SLOT 12	7	3G	3G	12G	3G	SAS	500000E0-168F8E99

//Set the slot 0x6 max. speed to 3G

CLI>link 6 3g 3g
CLI>st
CLI>
Reboot to take effect.

CLI>link
ArrayDevice Element (0x17):
==========

NAME	PHY	ORG	NLR	MAX	MIN	TYPE	ADDRESS
SLOT 01	13	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	12	6G	6G	12G	3G	SAS	5011B469-189AE00C
SLOT 03	14	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	15	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	9	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	8	**6G**	**3G[1]**	**3G**	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B

SLOT 09	5	6G	6G	12G	3G	SATA	5011B469-189AE005
SLOT 10	4	6G	6G	12G	3G	SATA	5011B469-189AE004
SLOT 11	6	3G	3G	12G	3G	SAS	500000E0-168F8E92
SLOT 12	7	3G	3G	12G	3G	SAS	500000E0-168F8E99

NOTE: 1. If EDFB is enabled, it will keep NLR=12G.

• EDFB Command (Same as "DHPM")

Use for 3G/6G SAS/SATA drive speed up as 12G drive performance. DataBolt™ Bandwidth Optimizer is designed to help facilitate the industry transition to 12Gb/s SAS-enabled systems by allowing users to take advantage of 12Gb/s speeds while utilizing existing 6Gb/s drives or backplanes.

Syntax
CLI>edfb [on | off] [i,j,..]
on - turn on all drive slot as 12G performance mode.
off - turn off all drive slot 12G performance mode.
i,j,.. - turn on/off drive slot i,j, …12G performance mode.

Example:
CLI>help edfb
Drive High Performance edfb { [on | off] [i,j,..] }

CLI>link
ArrayDevice Element (0x17):

NAME	PHY	ORG	NLR	MAX	MIN	TYPE	ADDRESS
SLOT 01	13	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	12	6G	**6G**	12G	3G	SAS	5011B469-189AE00C
SLOT 03	14	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	15	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	9	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	8	6G	6G	12G	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B

SLOT 09	5	6G	6G	12G	3G	SATA	5011B469-189AE005
SLOT 10	4	6G	6G	12G	3G	SATA	5011B469-189AE004
SLOT 11	6	3G	3G	12G	3G	SAS	500000E0-168F8E92
SLOT 12	7	3G	**3G**	12G	3G	SAS	500000E0-168F8E99

CLI>edfb on 2,12 ;;;;; set drive slot 2,12 on
CLI>st
Reset or PowerCycle

CLI>link
ArrayDevice Element (0x17):

==========

NAME	PHY	ORG	NLR	MAX	MIN	TYPE	ADDRESS
SLOT 01	13	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	12	6G	**12G**	12G	3G	SAS	5011B469-189AE00C
SLOT 03	14	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	15	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	9	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	8	6G	6G	12G	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B
SLOT 09	5	6G	6G	12G	3G	SATA	5011B469-189AE005
SLOT 10	4	6G	6G	12G	3G	SATA	5011B469-189AE004
SLOT 11	6	3G	3G	12G	3G	SAS	500000E0-168F8E92
SLOT 12	7	3G	**12G**	12G	3G	SAS	500000E0-168F8E99

CLI>edfb on ;;;;; set all drives on
CLI>st
Reset or PowerCycle

…….

• TH Command

The th command allows you to set the operate device temperature warning limit. Typical parameters include: High-Warn and Low-Warn are warning temperature in Celsius.

Syntax
CLI>th Index High-Warn Low-Warn

Example:
CLI>th

Temperature Element (0x04):

NAME	ID	CT(`C)	HTW	LTW	OTWarn
ENC. Temp	01	30	60	5	No
Chip Temp	02	64	85	5	No
Slot01 Temp	03	31	60	5	No
Slot02 Temp	04	32	60	5	No
Slot03 Temp	05	30	60	5	No
Slot04 Temp	06	31	60	5	No
Slot05 Temp	07	36	60	5	No
Slot06 Temp	08	32	60	5	No
Slot07 Temp	09	32	60	5	No
Slot08 Temp	10	35	60	5	No
Slot09 Temp	11	34	60	5	No
Slot10 Temp	12	32	60	5	No
Slot11 Temp	13	32	60	5	No
Slot12 Temp	14	32	60	5	No

CLI>th 2 79 0
Temperature Element (0x04):

NAME	ID	CT(`C)	HTW	LTW	OTWarn
ENC. Temp	01	30	60	5	No

Chip Temp	02	64	79	0	No
Slot01 Temp	03	31	60	5	No
Slot02 Temp	04	32	60	5	No
Slot03 Temp	05	30	60	5	No
Slot04 Temp	06	31	60	5	No
Slot05 Temp	07	36	60	5	No
Slot06 Temp	08	32	60	5	No
Slot07 Temp	09	32	60	5	No
Slot08 Temp	10	35	60	5	No
Slot09 Temp	11	34	60	5	No
Slot10 Temp	12	32	60	5	No
Slot11 Temp	13	32	60	5	No
Slot12 Temp	14	33	60	5	No

CLI>st
CLI>
Reboot to take effect.

CLI>th
Temperature Element (0x04):
==========

NAME	ID	CT(`C)	HTW	LTW	OTWarn
ENC. Temp	01	30	60	5	No
Chip Temp	02	64	79	0	No
Slot01 Temp	03	31	60	5	No
Slot02 Temp	04	32	60	5	No
Slot03 Temp	05	30	60	5	No
Slot04 Temp	06	31	60	5	No
Slot05 Temp	07	36	60	5	No
Slot06 Temp	08	32	60	5	No
Slot07 Temp	09	32	60	5	No
Slot08 Temp	10	35	60	5	No
Slot09 Temp	11	34	60	5	No

Slot10 Temp	12	32	60	5	No
Slot11 Temp	13	32	60	5	No
Slot12 Temp	14	33	60	5	No

• GROUP Command

The group command is used to associate the external port with the devices/phys as one zone group. The three external cable ports and all devices/phys slots will default associate with one zone group.

Syntax
gr {dev GroupNo[1..] {ci, cj, ck,..} Start-Index(D) End-Index(D) }
gr {off | [t10 off] }
dev : use drive slot index
GroupNo : groupno start from 1, max 8 groups ci, cj, ck,..: external cable connector. i, j, k,.. is the index which range from 0 to 3. According to view from connector side, index start from right to left or top to bottom. The cable c0, c1, or c2 is view from right to left or start from top to bottom.
Start-Index : Start slot index of zone range, [1.. max drive]
End-Index : End slot index of zone range, [1.. max drive]
off : clear the zone group setting.
t10 off : turn T10 mode off.

Example:
CLI>gr
Current PHY Group Mode: T10
Group-1: C0, C1, C2, Slot: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
Value: 0x0000000FFFFFFFFF

//Set the cable0 and slot 1 to slot 6 as group 1
CLI>gr dev 1 c0 1 6

New PHY Group Mode: T10
Group-1: C0, Slot: 1, 2, 3, 4, 5, 6
Value: 0x00000000000FFC00
Current PHY Group Mode: T10

Group-1: C0, C1, C2 Slot: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
Value: 0x0000000FFFFFFFFF

//Set the cable1 and cable2 and slot 7 to slot 16 as group 2
CLI>gr dev 2 c1, c2 7 16

New PHY Group Mode: T10
Group-1: C0, Slot: 1, 2, 3, 4, 5, 6
Value: 0x00000000000FFC00
Group-2: C1, C2, Slot: 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
Value: 0x000000000FF003FF

Current PHY Group Mode: T10
Group-1: C0, C1, C2 Slot: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
Value: 0x0000000FFFFFFFFF

CLI>st
Power Cycle to reboot

CLI>gr

Current PHY Group Mode: T10
Group-1: C0, Slot: 1, 2, 3, 4, 5, 6
Value: 0x00000000000FFC00
Group-2: C1, C2, Slot: 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
Value: 0x000000000FF003FF
//Clear the Zone group Setting
CLI>gr off

New PHY Group Mode: T10
Group-1: C0, C1, C2 Slot: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
Value: 0x0000000FFFFFFFFF

Current PHY Group Mode: T10
Group-1: C0, Slot: 1, 2, 3, 4, 5, 6
Value: 0x00000000000FFC00
Group-2: C1, C2, Slot: 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
Value: 0x000000000FF003FF

• SYS Command

The sys command is used to view the expander's information. Typical information includes: vendor, model name, serial/unit number, expander port number, product revision, chip name/chip revision, customer code, manufacture data revision and work time.

Syntax
CLI>sys

Example:
CLI>sys

```
==========================================
Hardware Revision Information:-
==========================================

 Vendor ID                  : Areca Technology Co Ltd.
                              Taiwan, R.O.C
 Model ID                   : ARC-8028
 Serial No.                 : 0000000000000000
 Unit Serial No.            :
 Expander SAS Address       : 0x5001B469189AE03F
 Product Revision           : 0
 Expander Chip ID           : 0x0233 (Ports : 36)
 Expander Chip Revision     : C0
 Customer Code              : 0x35 (R01)
 Manufacturer Data Revision : 0x01 12/12/13
 Working Time               : Day00000-00:00:06
 Dual Mode                  : Single


==========================================
Firmware Revision Information:-
==========================================
Boot Image:

  Revision: 100.BD.00.0A  12/05/13
```

Firmware Family: 0 OemFamily: 0
Fast Boot: Yes Image Address: 0x10000000

Firmware Copy 1:

Revision: 100.BD.01.0A 01/06/14
Firmware Family: 0 OemFamily: 0
Fast Boot: Yes Image Address: 0x10100000

Firmware Copy 2: [Active]

Revision: 100.BD.01.0A 01/06/14
Firmware Family: 0 OemFamily: 0
Fast Boot: Yes Image Address: 0x10200000

HAL Revision: 0.1.0.0 SES Revision: 0.1.0.0 SCE Revision: 0.1.0.0

• BU Command

The BU command allows you to control the buzzer attributes that have been controlled by SAS expander H/W. There are four sound levels defined by the expander H/W. The default warning is sound level 2 and critical: sound level 3.

Syntax
CLI>BU [Warning Critical] [MUTE]

Example:
CLI>BU
Buzzer Attribute:
Warning Beep: Sound 2
Critical Beep: Sound 3
CLI>BU 0x1 0x3
CLI>BU
Buzzer Attribute:
Warning Beep: Sound 1
Critical Beep: Sound 3
CLI>
When expander alarm with buzzer, you can temporarily mute it with the following command. The buzzer still can be activated by

the next different event.
CLI>BU MUTE

When expander alarm with buzzer, you can disable it completely by command "bu 0 0". If you would like to enable beeper, the command for default settings will be "bu 2 3".

• FAN Command

The fan command allows you to set the operate fan speed. Typical parameters include: LowestSpeed and WarningSpeed are fan speed in speed code from level 1 to 7.
The LowestSpeed is the speed code that fan operate in normal state, and the WarningSpeed is the speed code that fan operate in warning state; like as detect a device in over-temperature.

Syntax
CLI>fan LowestSpeed WarningSpeed

Example:
CLI>fan

Cooling Element (0x03):
==========

NAME	SPEED CODE	RPM	STATUS
Fan 01	2	3690	OK
Fan 02	2	4090	OK
Fan 03	2	3650	OK
Fan 04	2	4050	OK

Current FAN Speed Attribute:
Lowest SpeedCode: 2
Warning SpeedCode: 5

CLI>fan 3 7

New FAN Speed Attribute:
Lowest SpeedCode: 3
Warning SpeedCode: 7
Current FAN Speed Attribute:

```
Lowest  SpeedCode: 2
Warning SpeedCode: 5

CLI>st
CLI>
Reboot to take effect.

CLI>fan
Cooling Element (0x03):
========================================
             SPEED
NAME         CODE       RPM      STATUS
Fan 01          3      4140        OK
Fan 02          3      4630        OK
Fan 03          3      4140        OK
Fan 04          3      4490        OK

Current FAN Speed Attribute:

Lowest  SpeedCode: 3
Warning SpeedCode: 7
```

Fan internal command for different fan speed type:

fan -t [high | normal | low | vlow]

high : 6000 - 10000 rpm
normal : 1800 - 7000 rpm
low : 1000 - 2000 rpm
vlow : below 1000 rpm
The above is a rough value, user can set different to fit the fan speed type.

Default is normal.

• SPIN Command

The spin command defines the mode of staggering SATA drive spin-up function connected on the expander box. This command gives expander box the ability to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the opti-

mum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as:

Syntax
CLI>spin [Delay(D)[ms] Num(D)]
Expander issues the spin up the drives by [Num] drives with [Delay] ms.

Example:
CLI>spin
Current SpinUp Attribute:
Drive Number: 1
Delay: 1024 ms

CLI>spin 512 3

New SpinUp Attribute:
Drive Number: 3
Delay: 512 ms

Current SpinUp Attribute:
Drive Number: 1
Delay: 1024 ms

• ST Command

The st command stores system configurations or factory default configurations in flash. Since all the revised parameter setting is temporarily stored in the working RAM, the ST command saves those parameters permanently in flash ROM.

1. Store temporarily configurations in flash

   Syntax
   CLI>st

   Example:
   CLI>st
   CLI>

2. Store factory default configurations in flash

Syntax
CLI>st [default]

Example:
CLI>st default ;;;;; restore the setting to default
CLI>

• LSD Command

The lsd command is use for show the element devices status in the expander controller. With parameter, this command only show the seletct device status.

Syntax
CLI>lsd [hdd | temp | volt | pwr | con | ..]
Show SES elements information:

Example:
CLI>lsd

ArrayDevice Element (0x17):

NAME	PHY	ORG	NLR	MAX	MIN	TYPE	ADDRESS
SLOT 01	13	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	12	6G	**12G**	12G	3G	SAS	5011B469-189AE00C
SLOT 03	14	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	15	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	9	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	8	6G	6G	12G	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B
SLOT 09	5	6G	6G	12G	3G	SATA	5011B469-189AE005
SLOT 10	4	6G	6G	12G	3G	SATA	5011B469-189AE004
SLOT 11	6	3G	3G	12G	3G	SAS	500000E0-168F8E92
SLOT 12	7	3G	**12G**	12G	3G	SAS	500000E0-168F8E99

Connector Element (0x19):

NAME	PHY	NLR	TYPE	ROUTE	CONNECTED-ADDRESS
Connector00	0		05		
Connector00	1		05		
Connector00	2		05		
Connector00	3		05		
Connector01	4	12G	3F	S	50004D9F-74992000
Connector01	5	12G	3F	S	50004D9F-74992000
Connector01	6	12G	3F	S	50004D9F-74992000
Connector01	7	12G	3F	S	50004D9F-74992000
Connector02	8	12G	3F	S	50004D9F-74992000
Connector02	9	12G	3F	S	50004D9F-74992000
Connector02	10	12G	3F	S	50004D9F-74992000
Connector02	11	12G	3F	S	50004D9F-74992000

Cooling Element (0x03):

NAME	SPEED CODE	RPM	STATUS
Fan 01	5	2100	OK
Fan 02	5	2200	OK
Fan 03	Not-Installed		
Fan 04	Not-Installed		

Temperature Element (0x04):

NAME	ID	CT(`C)	HTW	LTW	OTWarn
ENC. Temp	01	32	60	5	No
Chip Temp	02	42	85	0	No

Voltage Element (0x12):

NAME	VOLT(V)	OVLMT	UVLMT	STATUS
1V	0.99	1.07	0.94	None
5V	4.96	5.32	4.63	None

PowerSupply Element (0x02):

NAME	STATUS
PowerSupply01	OK

```
PowerSupply02      OK

AudibleAlarm Element (0x06):
========================================
NAME              STATUS    ALMSTATE
Audible-Alarm     Normal          0
CLI>
```

• SHOWLOGS Command

The showlogs command allows you to display system event notifications that have been generated event by the SAS expander box.

Syntax
CLI>showlogs [DisplayMode(hex, detail, default)]

Example:
CLI>showlogs
00000000-00000000:PLATFORM:Firmware initialization started

Day00000-00:00:00 ENCLOSURE-Fan 01 Failed

• FDL Command

The box has added the expander firmware update through the CLI on the external RS-232 port. Before you process the firmware update, there are two block regions that you can update expander microcode on SAS expander box.
1. CODE region - for FW file : sas3xfwYYMMDD.fw
2. MFGB region - for Data file : mfg12gYYMMDD.dat

To update the expander controller firmware, follow the procedure below:

Syntax: all the commands please type in lower case
CLI>fdl { code | mfgb }

Then use XModem/(Checksum) protocol transmit file to update ROM Region. The following procedures is used to update firmware through the RS-232:

1. Open any UART communication tools like HypeTerminal(115200,n,8,1).

2. Press any key on HyperTerminal window, the window will show "CLI>" prompt.

3. Type help will show help screen.

4. One command to update firmware. Step as follow.
5. Issue download & update command under "CLI>".
   CLI>fdl code
   Please Use XModem Protocol for File Transmission.
   Use Q or q to quit Download before starting XModem.
   <-----expander prompt for ready to receive file to update.

6. Then under HyperTerminal program, use the pull down menu item transfer "Send" -> send files when dialog box prompt, choose "Xmodem" and the file in the directory then press "send".
   (a). If the expander receive the file under the timeout limit (60s), the process starts.
   (b). If time out, please retry the step 5 again.

7. You can also cancel the program step by type 'q'.

8. If transfer OK, the transfered data is updated. Cold-start expander (Power cycle again) to take effect.

Example:
Update procedure, use Xmodem to transfer, refer to "fdl" command for detail operation.
CLI>fdl { code | mfgb }

Use HyperTerminal or TeraTerm utility with Xmodem mode to transfer and update files.
If transfer OK, the transfered data is updated. Cold-start expander (Power cycle again) to take effect.

The following firmware and data are available in the following filename format.
1. FW file (CODE) : sas3xfwYYMMDD.fw

2. Data file (MFGB) : mfg12gYYMMDD.dat

Update SAS expander firmware:
CLI>fdl code
Use HyperTerminal or TeraTerm utility with Xmodem mode to transfer sas3xfwYYMMDD.fw.
If transfer OK, the transfered data is updated. Cold-start expander (Power cycle again) to take effect.

Update SAS expander data file:
CLI>fdl mfgb

Use HyperTerminal or TeraTerm utility with Xmodem mode to transfer mfg12gYYMMDD.dat.
If transfer OK, the transfered data is updated. Cold-start expander (Power cycle again) to take effect.

• Counters Reset Command

Display/Reset all phy counters counters reset (optional).
CLI>counters reset
Phy counters successfully reset.

CLI>counters
Phy Layer Error Counters==========
== InvWrdCnt ==DispErrCnt ==LossSyncCnt ==RstSeqFailCnt=

Phy 00	0x00000000	0x00000000	0x00000000	0x00000000
Phy 01	0x00000000	0x00000000	0x00000000	0x00000000
Phy 02	0x00000000	0x00000000	0x00000000	0x00000000
Phy 03	0x00000000	0x00000000	0x00000000	0x00000000
Phy 04	0x00000000	0x00000000	0x00000000	0x00000000
Phy 05	0x00000000	0x00000000	0x00000000	0x00000000
Phy 06	0x00000000	0x00000000	0x00000000	0x00000000
Phy 07	0x00000000	0x00000000	0x00000000	0x00000000
Phy 08	0x00000000	0x00000000	0x00000000	0x00000000
Phy 09	0x00000000	0x00000000	0x00000000	0x00000000
Phy 10	0x00000000	0x00000000	0x00000000	0x00000000
Phy 11	0x00000000	0x00000000	0x00000000	0x00000000
Phy 12	0x00000000	0x00000000	0x00000000	0x00000000
Phy 13	0x00000000	0x00000000	0x00000000	0x00000000
Phy 14	0x00000000	0x00000000	0x00000000	0x00000000

Phy 15	0x00000000	0x00000000	0x00000000	0x00000000
Phy 16	0x00000000	0x00000000	0x00000000	0x00000000
Phy 17	0x00000000	0x00000000	0x00000000	0x00000000
Phy 18	0x00000000	0x00000000	0x00000000	0x00000000
Phy 19	0x00000000	0x00000000	0x00000000	0x00000000
Phy 20	0x00000000	0x00000000	0x00000000	0x00000000
Phy 21	0x00000000	0x00000000	0x00000000	0x00000000
Phy 22	0x00000000	0x00000000	0x00000000	0x00000000
Phy 23	0x00000000	0x00000000	0x00000000	0x00000000
Phy 24	0x00000000	0x00000000	0x00000000	0x00000000
Phy 25	0x00000000	0x00000000	0x00000000	0x00000000
Phy 26	0x00000000	0x00000000	0x00000000	0x00000000
Phy 27	0x00000000	0x00000000	0x00000000	0x00000000

Link Layer Event Counters
Phy Event Counter Not Configured.
Generic Broadcast Counter
Broadcast Counter Not Configured.
Generic Broadcast Counter
Broadcast Counter Not Configured.

• Sasaddr Command

CLI>sasaddr

Expander New SAS Address: 0x5001B4690400083F
Expander Current SAS Address:
EXP Port SAS Address: 0x5001B4690400083F
SXP Port SAS Address: 0x5001B4690400083D
STP Port SAS Address: Disabled

• Sub Command

The subtractive command allows you to set the subtractive ports on expander.

1. Set external cable link ports

   Syntax
   CLI>sub [{c0..c3} l def]
   Index: c0..c3 External Cable Index

The cable c0, c1, c2, or c3 is view from right to left or start from top to bottom.

Example:
CLI>sub c0,c1 ; set cable0 and cable1 as subtractive ports
CLI>st
CLI>
Reboot to take effect.

2. Set internal slot link ports

Syntax
CLI>sub [0..47]
Index:0..47 Internal Slot Index

Example:
CLI>sub 8,9,10,11 ; set phy 8/9/10/11 as subtractive ports
CLI>st
CLI>
Reboot to take effect.